

CLAIMS

1. A method of applying a patterned thin-film onto a substrate comprising the steps:-
 - i) plasma treating the substrate
 - ii) Applying a liquid coating material, comprising one or more compounds selected from the group of organopolysiloxane polymers, organopolysiloxane oligomers, siloxane resins and polysilanes, onto the substrate surface, by a soft lithographic printing technique, to form a patterned film thereon; and
 - iii) where required, removing residual liquid coating material from the substrate surface;

which process does not require the liquid coating material undergo a curing step.
2. A method of applying a patterned thin-film in accordance with claim 1 wherein the resulting film has a thickness in the region of from 1 to 100 nm.
3. A method of applying a patterned thin-film in accordance with claim 1 or 2 wherein step (i) is carried out utilising a suitable source selected from the group of an atmospheric pressure glow discharge source, a dielectric barrier discharge (DBD) source, a low pressure glow discharge or post discharge plasma source, a corona discharge source and/or a microwave discharge source.
4. A method of applying a patterned thin-film in accordance with any preceding claim wherein the substrate to be coated is selected from metals, metal foils metal oxides, glass, carbonaceous materials, ceramics, semi-conductor materials, plastics, liquid crystals, polymeric silicon containing materials, cellulosic materials, laminates and/or photoresist materials.

5. A method of applying a patterned thin-film in accordance with any preceding claim wherein the substrate is pre-treated.
6. A method of applying a patterned thin-film in accordance with claim 5 comprising the step of pretreating the substrate by introducing an atomised liquid and/or solid coating-forming material into an atmospheric pressure plasma discharge and/or an ionised/excited gas stream resulting therefrom, and exposing the substrate to the atomised coating-forming material under conditions of atmospheric pressure.
7. A method of applying a patterned thin-film in accordance with any preceding claim wherein the liquid organopolysiloxane polymer/oligomer used in the process of the present invention may be any appropriate linear, branched or cyclic organopolysiloxane or copolymers thereof or a low molecular weight silicone resin in a liquid or wax form.
8. A method of applying a patterned thin-film in accordance with claim 7 wherein the linear or branched organopolysiloxane polymer/oligomer has a general formula:-

W-A-W

where A is a polydiorganosiloxane chain having siloxane units of the formula $R''_sSiO_{4-s/2}$ in which each R'' independently represents an alkyl group having from 1 to 40 carbon atoms, an alkenyl group; hydrogen; an aryl group, a halide group, an alkoxy group, an epoxy group, an acryloxy group, an alkylacryloxy group, wherein any of the R'' groups may contain fluorine groups, s has a value of 0,1 or 2 groups; and

W is selected from $-Si(R'')_2X$, or



where B is $-R'''-(Si(R'')_2-O)_r-Si(R'')_2-$ and

R" is as aforesaid, R"" is a divalent hydrocarbon group r is zero a whole number between 1 and 6 and d is 0 or a whole number, most preferably d is 0, 1 or 2, X may be the same as R" or a hydrolysable group such as an alkoxy group containing alkyl groups having up to 6 carbon atoms, an epoxy group or a methacryloxy group or a halide.

9. A method of applying a patterned thin-film in accordance with any preceding claim wherein the substrate is plasma treated and then subsequently has the organopolysiloxane coating material applied on to it by any appropriate application method, for example the substrate may be screen printed or dipped into a bath of the organopolysiloxane coating material, sprayed with coating material, painted with coating material or placed in an atmosphere of a gaseous or aerosol-like coating material for a predetermined time period sufficient to result in a coating of the substrate.
10. A method of applying a patterned thin-film in accordance with claim 9 wherein the soft-lithographic printing technique.
11. A method of applying a patterned thin-film in accordance with claim 10 wherein the soft-lithographic printing technique is micro contact printing (μ CP).
12. A method of applying a patterned thin-film in accordance with any preceding claim wherein subsequent to application a thin film on the substrate is at least partially further plasma treated and/or an additional coating is applied to a second layer to the thin film.
13. A method in accordance with any preceding claim wherein the method is carried out in a continuous process.
14. Use of a process in accordance with any preceding claim wherein the thin film is utilised to modify the surface alignment of a liquid crystal.

15. Use in accordance with claim 12 wherein the thin film is applied using a soft lithographic printing technique.
16. Use of a process in accordance with any preceding claim wherein the thin film is utilised as hydrophobic tracks to control material placement during subsequent processes such as spin-coating and ink-jet printing.
17. A method as hereinbefore described with reference to the examples.
18. A method for modifying the alignment of a liquid crystal comprising applying a thin film onto a substrate surface in accordance with any one of claims 1 to 13 such that the alignment of a liquid crystal is modified.
19. A substrate comprising a thin film applied in accordance with the method of any one of claims 1 to 13.
20. A coated substrate obtainable by the method in accordance with any one of claims 1 to 13.
21. A method in accordance with any of claims 1 to 13 wherein a region of the substrate surface is masked to substantially prevent or inhibit further physical or chemical changes to the previously uncoated partially coated or fully coated substrate surface during a process step.